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NOTEWORTHY COLLECTIONS

CALIFORNIA

VIBURNUM EDULE (Michx.) Raf. (CAPRIFOLIACEAE).—Siskiyou Co., McCloud, in a spring-fed montane riparian/montane meadow habitat. Associated species include *Salix lucida*, *Crataegus suksdorfii*, *Spiraea douglasii*, *Ribes nevadense*, *Prunus virginiana*, *Rhamnus purshiana*, *Cornus sessilis*, *Carex* spp., *Juncus* spp., *Mimulus guttatus*, *Populus trenuloides*, and *Pinus ponderosa*. Girard Ridge USGS 7.5′ quadrangle, T39N R3W NE¼ Sec. 12, UTM 10 0572283E 4568912N, elevation 945 m, 5 July 2007, *L. Lindstrand III, s. n.* (North State Resources Herbarium[1] [private], Shasta-Trinity National Forest Herbarium[2], JEPS).

Previous Knowledge. Viburnum edule has not previously been recorded from California. The species is known to occur across Canada and the northern U.S. in moist forests and swamps. This finding represents the first record of the species in California, and also represents the southernmost-recorded extent of the species on the west coast of North America. At the McCloud site the species was first observed in vegetative and flowering condition on 12 June 2007, when a small amount of material was collected in the field. Following an initial examination, the plant was considered to be an undetermined species of *Viburnum*. Subsequently, the species was examined by the second author and tentatively identified as *Viburnum edule*. Additional plant material was collected in the field on 5 July 2007, and a voucher was sent to the Jepson Herbarium for annotation, where herbarium staff confirmed the species identification as *Viburnum edule*, noting that the determination "is obvious".

Significance. This represents the first recorded observation of *Viburnum edule* in California, and along with *Viburnum ellipticum*, is the second species of *Viburnum* known to occur in the state. This also represents a southern extension of the species in the west coast portion of its range. *Viburnum edule* occurs from Alaska to Newfoundland, south to Oregon, northern Idaho, Colorado, Minnesota, and Pennsylvania; including sixteen states and twelve provinces (NatureServe, 2007, NatureServe Explorer: An online encyclopedia of life [web application], Version 6.2, NatureServe, Arlington, Virginia, Available http://www.natureserve.org/explorer, Accessed November 19, 2007). *Viburnum edule* is currently designated by the states of Michigan, New York, and Vermont as a threatened species, as endangered by the state of Wisconsin, and as a special concern species in Maine. In the northwestern U.S., *Viburnum edule* occurs in western, central and northeastern Washington, northern Idaho, and north-central Oregon (Hitchcock, C. L., A. Cronquist, M. Ownbey, and J. W. Thompson [eds.], 1959, Vascular Plants of the Pacific Northwest, Vol. 4, Seattle, WA), and has no conservation status in those states. The nearest recorded locations are approximately 402 km north of the McCloud site in the Cascade Range of central Oregon at Mink Lake Basin, Lane County, at 1410 m elevation (Oregon Plant Atlas, Oregon Flora Project, [web application], Available http://www.oregonflora.org, [Accessed November 5, 2007]) (R. E. Brainerd #57, September 4, 1997; ZUMREB57).

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CALIFORNIA

ATRIPLEX AMNICOLA Paul G. Wilson (CHENOPODIACEAE).—Los Angeles Co., City of Malibu, Malibu Lagoon at Pacific Coast Hwy., UTM (NAD 83) 11S 0344636E 3766992N, elev. 10 m, locally common on beach sands, in sandy scrub, edge of salt marsh, and along paths and access roads, 8 Jul 2006, *Riefner 06-289* (CANB, CDA, RSA). Orange Co., City of Dana Point, beach south of Salt Creek near Ritz Carlton Hotel at Pacific Coast Hwy., UTM (NAD 83) 0433601E 3702917N, elev. 2 m, uncommon, 22 May 1999, *Riefner 99-290* (RSA); same locality, 9 Sep 2005, *Riefner 05-658* (RSA); City of Newport Beach, Upper Newport Bay, E of Bayside Dr. at confluence with Big Canyon drainage, UTM (NAD 83) 11S 0418191E 3721588N, elev. 6 m, locally common, edge of salt marsh and in *Atriplex lentiformis* scrub, 16 Sep 2005, *Riefner 05-666* (CANB, CDA, RSA); City of San Clemente, along north-bound I-5 Freeway at Camino de Estrella exit, UTM (NAD 83) 11S 0439445E 3702126N, elev. 67 m, frequent, annual grassland and planted *Eucalyptus* stand, 12 Feb 2006, *Riefner 06-21* (CANB, CDA, RSA); City of Newport Beach, N shore of Newport Bay, near Bayview Wy. and Bayview Pl., UTM (NAD 83) 11S 0419132E 3723855N, elev. 7 m, common, edge of riparian scrub and in coastal sage scrub, 17 Apr 2006, *Riefner 06-155* (CDA, RSA); City of Newport Beach, E of Newport Bay, Big Canyon Creek drainage near Back Bay Dr., UTM (NAD 83) 11S 0417997E 3721493N, elev. 9 m, common, edge of salt marsh, on alkaline flats, and in disturbed scrub, 6 Aug 2006, *Riefner 06-381* (CDA, RSA); City of San Juan Capistrano, San Juan Creek, ca. 0.2 mi W of intersection of Paseo Tirador and Calle Arroyo St., UTM (NAD 83) 11S 0439010E 3706660N, elev. 31 m, locally common, edge of riparian woodland and in open field, 4 Aug 2007, *Riefner 07-344* (RSA); City of San Juan Capistrano, San Juan Creek, vicinity of San Juan Creek Rd. and Paseo Christina, UTM (NAD 83) 11S 0440852E 3707792N, elev. 34 m, locally common, dirt lot, disturbed creek bank, and *Baccharis salicifolia* scrub, 11 Sep 2007, *Riefner 07-378* (RSA); City of San Clemente, vicinity of Calle Vicente and Ave. Vaquero, UTM (NAD 83) 0440240E 3702184N, elev. 40 m, locally common on roadside slopes, 26 Oct 2007, *Riefner 07-455* (RSA); City of San

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[2] Shasta-Trinity National Forest Herbarium, 3644 Avtech Parkway, Redding, CA 96002.

Clemente, vicinity of Camino de Los Mares and Calle Nuevo, UTM (NAD 83) 0440303E 3702760N, elev. 45 m, large population on steep slope near residential community, spreading to roadsides and coastal sage scrub, 25 May 2008, *Riefner 08-118* (RSA). San Diego Co., University City, Governor Dr. on-ramp at Hwy. 805, UTM (NAD 83) 11S 0482779E 3635380N, elev. 117 m, uncommon, roadside in ruderal vegetation, 19 Nov 2006, *Riefner 06-681* (RSA).

Previous knowledge. Atriplex amnicola (river saltbush) was not included in The Jepson Manual or in recent publications listing non-native species or facultative exotic wetland plants recently established in California (Taylor and Wilken 1993, *in* Hickman, ed., The Jepson Manual: Higher Plants of California, University of California Press, Berkeley, CA; Hrusa et al. 2002, Madroño 46: 61–98; DiTomaso and Healy 2003, Aquatic and Riparian Weeds of the West, U.C. Agriculture and Natural Resources Publication 3421, Oakland, CA; DiTomaso and Healy 2007, Weeds of California and other Western States, Vol. 1, Aizoaceae–Fabaceae, U.C. Agriculture and Natural Resources Publication 3488, Oakland, CA; Grewell et al. 2007, Estuarine wetlands, *in* M.G. Barbour, T. Keeler-Wolf, and A.A. Schoenherr, eds., Terrestrial Vegetation of California, 3rd ed., University of California Press, Berkeley, CA; Riefner and Boyd 2007, J. Bot. Res. Inst. Texas 1: 709–730). *Atriplex amnicola*, a native of Australia, however, is well established on sea beaches and in coastal scrub near Malibu in Los Angeles County (Welsh 2004, *in* Flora of North America, Vol. 4, Oxford University Press, New York, NY). A small population has recently been reported from Newport Back Bay in Orange County, where it is spreading rapidly (Clarke et al. 2007, Flora of the Santa Ana River and Environs, Heyday Books, Berkeley, CA).

In Western Australia, *A. amnicola* occurs in coastal regions and inland sites along creeks and the margins of salt lakes (Wilson 1984, *in* Flora of Australia, Vol. 4, Australian Government Publishing Service, Canberra, Australia.). It is one of a suite of saltbushes utilized for rehabilitation of saltland pasture and harvested for commercial seed production in Western Australia (Barrett-Lennard 2003, Saltland Pastures in Australia-A Practical Guide, Land, Water and Wool, Canberra, Australia; Tranen Revegetation Systems 2005, Australian Native Seed Catalogue, Jolimont, Western Australia; Stevens et al. 2006, Australian J. Agricultural Res. 57: 1279–1289). Due to its tolerance to saline soils and waterlogged conditions, *A. amnicola* is also used for reclaiming salt-affected wasteland in developing countries (Asad 2002, Communications in Soil Science and Plant Analysis 33: 973–989; Menzel and Lieth 2003, *in* Leith and Mochtchenko, eds., Cash Crop Halophytes: Recent Studies, Kluwer Academic Publishers, Dordrecht). Saltbushes (*Atriplex* spp.), both native and exotic species introduced from Australia, South and North America are also utilized in large-scale arid land rehabilitation in the Mediterranean Basin (Le Houérou 1992, Agroforestry Systems 18: 107–148). Accordingly, *Atriplex* seed, including *A. amnicola*, is readily available on the worldwide market for use in restoring saline soil habitats (B & T World Seeds 2008, List 154–Plants for Salty Conditions, accessed May 2008, <http://www.b-and-t-world-seeds.com/homepage.htm>).

Significance. First documented report of *A. amnicola* for San Diego County, and the first populations documented outside of the Santa Ana River watershed in Orange County (Roberts 1998, A Checklist of the Vascular Plants of Orange County, California, 2nd ed., F.M. Roberts Publications, Encinitas, CA; Hrusa et al. 2002 *loc. cit.*; Rebman and Simpson 2006, Checklist of the Vascular Plants of San Diego County, 4th ed., San Diego Natural History Museum, San Diego, CA; Clarke et al. 2007 *loc. cit.*). *Atriplex amnicola* has not been documented from western Riverside County (Roberts et al. 2004, The Vascular Plants of Western Riverside County, California: An Annotated Checklist, F. M. Roberts Publications, San Luis Rey, CA).

Based on field observations in southern California, *A. amnicola* occupies habitats similar to big saltbush [*Atriplex lentiformis* (Torrey) S. Watson], which includes saline to moderately alkaline soils of salt marsh transition zones, the coastal strand, and non-saline sage scrub, stream bank and riparian communities, and ruderal or roadside habitats. *Atriplex amnicola* may have been introduced via seed mixes used to restore/enhance coastal lagoon ecosystems before more rigorous guidelines were adopted that prioritize the use of appropriately adapted native plants over exotic species for natural community revegetation programs (Rodgers and Montalvo 2004, Genetically Appropriate Choices for Plant Materials to Maintain Biological Diversity, University of California, Davis). *Atriplex amnicola*, however, is apparently still being utilized in seed mixes designed for habitat restoration and erosion control projects in coastal Orange County and possibly in San Diego County. It is spreading rapidly from landscaped slopes in urban environments to native plant communities. Owing to its availability on the commercial seed market, ecological adaptability, and widespread success in rehabilitating degraded lands, it is expected elsewhere in the South Coast region. *Atriplex amnicola* appears to be an invasive shrub that could displace native plants and disrupt natural ecosystems in southern California.

ATRIPLEX GLAUCA L. (CHENOPODIACEAE).—Los Angeles Co., Port of Los Angeles, City of San Pedro, Cabrillo Beach along Via Cabrillo Marina Rd. near Shoshonean Rd., UTM (NAD 83) 11S 0380990E 3731603N, elev. 10 m, uncommon, growing with *Atriplex semibaccata* on unstable bluff soils, 21 Jan 2006, *Riefner 06-11* (RSA); Palos Verdes Peninsula, vicinity of Via Alar and Palos Verdes Dr. West, UTM (NAD 83) 11S 0371250E 3741020N, elev. 64 m, locally common on brushy slopes, 10 Mar 2007, *Riefner 07-121* (RSA); Palos Verdes Peninsula, Portuguese Bend, 0.5 mi S of Peppertree Dr. on Palos Verdes Dr. South, UTM (NAD 83) 11S 0374057E 3734168N, elev. 68 m, uncommon on roadsides and in annual grassland, 21 Apr 2007, *Riefner 07-181* (RSA). Orange Co., City of Newport Beach, Upper Newport Bay, general vicinity of Bayview Wy. and Bayview Pl., UTM (NAD 83) 11S 0419132E 3723855N, elev. 7 m, common, growing on edge of riparian woodland and in coastal sage scrub, 4 May 2002, *Riefner 02-88* (CDA, RSA); City of Newport Beach, E of Newport Bay, E of Back Bay Dr. near Big Canyon Creek, UTM (NAD 83) 11S 0418138E 3721615N, elev. 5 m, common, growing on edge of salt marsh, 4 May 2002, *Riefner 02-89* (CDA, RSA); City of Lake Forest, E side of SR-241 ca. 0.5 mi N of Alton Pkwy., UTM (NAD 83) 11S 0436667E 3727953N, elev. 230 m, locally common, growing with *Atriplex semibaccata* on roadside and edge of avocado grove, 13 Dec 2005, *Riefner 05-784* (CDA, RSA); City of Newport Beach, W side of MacArthur Blvd. near San Joaquin

St., UTM (NAD 83) 11S 0419715E 3719909N, elev. 75 m, locally common, growing with *Atriplex semibaccata* in power line right-of-way and edge of coastal sage scrub, 1 Feb 2006, *Riefner 06-30* (CDA, RSA); City of Newport Beach, near Avocado Ave. and San Nicolas Dr., W of MacArthur Blvd., UTM (NAD 83) 11S 0419405E 3719645N, elev. 77 m, locally common, growing with *Atriplex semibaccata* on roadside and in annual grassland, 19 Mar 2006, *Riefner 06-52* (CDA); City of Rancho Santa Margarita, W side of SR-241 near Los Alisos Blvd., UTM (NAD 83) 11S 0441877E 3724130N, elev. 292 m, uncommon in coastal sage scrub, 20 Jun 2006, *Riefner 06-253* (CDA, RSA); City of Rancho Santa Margarita, vicinity of Towne Center Dr. and Alton Pkwy., UTM (NAD 83) 11S 0437713E 3726926N, elev. 291 m, uncommon in coastal sage scrub and on roadside, 30 Jun 2006, *Riefner 06-334* (RSA); City of San Juan Capistrano, San Juan Creek at Hwy. 74, UTM (NAD 83) 11S 0441820E 3709001N, elev. 56 m, locally common on roadsides and sparse sage scrub, 22 Jan 2007, *Riefner 07-20* (RSA); Ladera Ranch/San Juan Capistrano area, Antonio Pkwy. ca. 0.6 mi S of Covenant Hills Rd., UTM (NAD 83) 11S 0442042E 3710740N, elev. 170 m, uncommon, roadside and non-native grassland, 22 Aug 2007, *Riefner 07-370* (RSA). Riverside Co., City of Corona, along Magnolia Ave. off-ramp on SW side of I-15 Freeway, UTM (NAD 83) 11S 0450110E 3747033N, elev. 216 m, uncommon, growing with roadside ruderal plants, 12 Dec 2002, *Riefner 02-521* (RSA); City of La Sierra, Gramercy Pl. near La Sierra Ave., UTM (NAD 83) 11S 0454476E 3754271N, elev. 227 m, rare, growing with *Atriplex suberecta* on disturbed lot, 30 Dec 2005, *Riefner 05-792* (RSA); City of Corona, vicinity of Green River Rd. and Palisades Dr., UTM (NAD 83) 11S 0440802E 3749217N, elev. 16 m, uncommon in coastal sage scrub, 22 Aug 2006, *Riefner 06-399* (RSA). San Diego Co., City of La Jolla, E of I-5 Freeway near Town Center Dr., UTM (NAD 83) 11S 0479754E 3638753N, elev. 104 m, uncommon in coastal sage scrub and margin of dirt road, 17 Aug 2003, *Riefner 03-339* (RSA, UCR); City of Carlsbad, Carlsbad Blvd. near Tierra del Oro St., UTM (NAD 83) 11S 0468532E 3666310N, elev. 18 m, locally abundant in coastal bluff scrub, 6 Dec 2003, *Riefner 03-492* (RSA, UCR); City of Carlsbad, vicinity of Encina Power Station, Carlsbad Blvd., ca. 0.3 mi N of Tierra del Oro St., UTM (NAD 83) 11S 0468471E 3666435N, elev. 13 m, locally abundant, coastal bluff scrub and coastal strand vegetation, 3 Jul 2005, *Riefner 05-544* (CDA, RSA, SD, UCR); City of Carlsbad, Agua Hedionda, inlet channel at Carlsbad Blvd., UTM (NAD 83) 11S 0468013E 3667422N, elev. 4 m, locally common on road bank and along fisherman trail with *Atriplex semibaccata*, 19 Sep 2005, *Riefner 05-668* (RSA, UCR); City of Carlsbad, Carlsbad Blvd. at Shore Dr., UTM (NAD 83) 11S 0468823E 3665819N, elev. 14 m, uncommon on disturbed lot with *Atriplex semibaccata*, 19 Sep 2005, *Riefner 05-670* (RSA, UCR); City of Carlsbad, South Carlsbad, Carlsbad Blvd. ca 0.2 mi N of Island Wy. at Ponto Beach, UTM (NAD 83) 11S 0469682E 3664127N, elev. 9 m, uncommon, disturbed roadside and on ocean bluff, 23 Nov 2005, *Riefner 05-767* (CDA, RSA); City of Del Mar, SW ca. 0.2 mi from intersection of Carmel Valley Rd. and Via Mar Valle Rd., UTM (NAD 83) 11S 0475686E 3644616N, elev. 19 m, common, spreading from roadsides to native coastal sage scrub vegetation with *Encelia californica* and *Rhus integrifolia*, 16 Jan 2006, *Riefner 06-1* (RSA, UCR); City of Oceanside, Buena Vista Lagoon, vicinity of Rue des Chateaux at Ocean St., UTM (NAD 83) 11S 0466584E 3669564N, elev. 3 m, locally established on sand dune, 15 Oct 2007, *Riefner 07-430* (RSA).

Previous knowledge. *Atriplex glauca* (gray saltbush or glaucous-leaved saltbush) is native to the Mediterranean Basin (Tutin et al., eds., 1980, *in* Flora Europaea, Vol. 1, Cambridge University Press, New York, NY). It has not been included in treatments of the Chenopodiaceae in floras covering North America or other major publications addressing non-native plants established in California (Taylor and Wilken 1993 *loc. cit.*; Hrusa et al. 2002 *loc. cit.*; Welsh 2004 *loc. cit.*; DiTomaso and Healy 2007 *loc. cit.*; Grewell et al. 2007 *loc. cit.*). *Atriplex glauca*, however, is well established outside of cultivation in coastal southern California, but has not been reported previously from western Riverside County or San Diego County (Roberts et al. 2004 *loc. cit.*; Rebman and Simpson 2006 *loc. cit.*). It was likely first introduced in seed mixes used for erosion control programs (Boyd 1999, Aliso 18: 93–139; Clarke et al. 2007 *loc. cit.*).

Atriplex glauca seed has been available on the commercial market in California since at least the early 1990's, and is well known for its hardiness and tolerance to alkaline and harsh soil conditions (City of Riverside Planning Department 1994, Water Efficient Landscaping and Irrigation Ordinance Summary and Design Manual, Riverside, CA; USDA 1995, Commercial Suppliers of Tree and Shrub Seed in the United States, Miscellaneous Report M8-MR 33, Washington, DC; S & S Seeds 2005, Seed Selection Guide, Carpinteria, CA).

Significance. First documented reports of *A. glauca* for Riverside and San Diego counties, and extensions of range for Los Angeles County outside the Liebre Mountains, and for Orange County outside of the Santa Ana River watershed (Boyd 1999 *loc. cit.*; Rebman and Simpson 2006 *loc. cit.*; Clarke et al. 2007 *loc. cit.*). This shrub is more common than herbarium records indicate, and is spreading rapidly from landscaped areas to disturbed urban habitats and native plant communities. Much like *A. annicola*, *A. glauca* is a well-known halophyte (Menzel and Lieth 2003 *loc. cit.*). Additional populations of *A. glauca* are to be expected throughout the South Coast region and in many habitats, including the coastal strand, salt marsh-upland transition zones, dune swales, coastal sage scrub, non-native grassland, and ruderal or roadside habitats.

Based on field observations, *A. glauca* occupies habitats similar to Australian saltbush (*Atriplex semibaccata* L.), which is an aggressive invader that displaces native plants and disrupts natural ecosystems (Bossard et al. 2000, Invasive Plants of California's Wildlands, UC Press, Berkeley, CA). *Atriplex glauca* is more robust and apparently more broadly adapted than *A. semibaccata*, and is invading undisturbed coastal sage scrub communities where *A. semibaccata* does not. Owing to its invasiveness, *A. glauca* should not be planted outside of managed landscapes or for erosion control projects that are adjacent to native plant communities or natural open space areas without careful consideration (University of California Cooperative Extension 2000, Estimating the Irrigation Water Needs of Landscape Plantings in California, Department of Water Resources, Sacramento, CA).

ATRIPLEX MUELLERI Benth. (CHENOPODIACEAE).—Imperial Co., E of El Centro, along Ross Rd. near Bass Cove Rd., N of Hwy. 8, UTM (NAD 83) 11S 0638008E 3628013N, elev. ca. −9 m, common along irrigation ditch and on roadsides, 9 Oct 2006, *Riefner 06-513* (CANB, CDA, RSA); E of El Centro, Ross Rd. ca. 0.2 mi E of Dogwood St., N of Hwy. 8, UTM (NAD 83) 11S 0637549E 3628051N, elev. ca. −9 m, common on vernal alkaline flats with *Suaeda moquinii*, 9 Oct 2006, *Riefner 06-515* (CANB, CDA, RSA); E of El Centro, Ross Rd. at Hawkeye Rd. off Hwy. 111, UTM (NAD 83) 11S 0640473E 3628049N, elev. ca. −8 m, common along roadside in ruderal vegetation, 9 Oct 2006, *Riefner 06-519* (RSA); near Seeley, along Drew Rd. at Hwy. 8, UTM (NAD 83) 11S 0622670E 3627210N, elev. ca. −10 m, uncommon, roadside depression with *Malvella leprosa*, 9 Oct 2006, *Riefner 06-520* (RSA).

Previous knowledge. *Atriplex muelleri* (Mueller's saltbush) is native to Australia (Wilson 1984 *loc. cit.*; Barker et al., eds., 2005, Census of South Australian Vascular Plants, 5th ed., J. Adelaide Bot. Gard. Supplement 1, Botanic Gardens of Adelaide and State Herbarium, Adelaide). It was not included in the treatment of *Atriplex* for California by Taylor and Wilken (1993 *loc. cit.*), and Welsh (2004 *loc. cit.*) was unable to verify its presence in North America. *Atriplex muelleri* has recently been reported, however, for Riverside County from specimens collected in 1965 near Blythe (*Roos s.n.*; COLO, UC, UCR!) (Hrusa et al. 2002 *loc. cit.*). The Blythe population has apparently been extirpated (Hrusa et al. 2002 *loc. cit.*).

Significance. First documented reports of *A. muelleri* for Imperial County. *Atriplex muelleri* is a halophyte, and seed is available for purchase on the world market for use in restoring degraded saline soil habitats (Menzel and Lieth 2003 *loc. cit.*; B & T World Seeds 2008 *loc. cit.*). *Atriplex muelleri* is similar to *A. semibaccata* (Welsh 2004 *loc. cit.*). Therefore, it may be overlooked in the field and could be more widespread than our records indicate. *Atriplex muelleri* is expected to occur elsewhere in disturbed and ruderal habitats, and in low-lying, vernally moist alkaline sites in the California deserts and the inland valleys of the South Coast region, especially the saline-alkali vernal plains of western Riverside County.

ATRIPLEX STIPITATA Benth. (CHENOPODIACEAE).—Los Angeles Co., City of San Pedro, Cabrillo Beach Park near Salinas de San Pedro, UTN (NAD 83) 11S 0380844E 3730983N, elev. 13 m, local in coastal sage scrub exhibit garden and uncommon on nearby bluff slope, 21 Jan 2006, *Riefner 06-11* (CANB, CDA).

Previous knowledge. *Atriplex stipitata* (mallee saltbush or kidney saltbush) is native to the semi-arid regions of Southern Australia (Wilson 1984 *loc. cit.*; Walsh 1996, Chenopodiaceae, *in* N.G. Walsh and T.J. Entwistle, eds., Flora of Victoria, Vol. 3, Inkata Press, Melbourne, Australia; Barker et al. 2005 *loc. cit.*). It has not been reported previously for North America (Taylor and Wilken 1993 *loc. cit.*; Welsh 2004 *loc. cit.*). *Atriplex stipitata* was also not included in recent publications addressing non-native species established in California or in local floras covering the South Coast region (Roberts 1998 *loc. cit.*; Hrusa et al. 2002 *loc. cit.*; Roberts et al. 2004 *loc. cit.*; Rebman and Simpson 2006 *loc. cit.*; Clarke et al. 2007 *loc. cit.*; DiTomaso and Healy 2007 *loc. cit.*; Riefner and Boyd 2007 *loc. cit.*). *Atriplex stipitata*, a halophyte, is sold on the worldwide market for rehabilitation of saline soil habitats (Menzel and Lieth 2003 *loc. cit.*; B & T World Seeds 2008 *loc. cit.*).

Significance. First documented report of *A. stipitata* for North America. *Atriplex stipitata*, a 1 m tall shrub, has narrowly elliptic to orbicular leaves and could be confused with small forms of *A. lentiformis* in southern California. *Atriplex stipitata*, however, is readily separated from *A. lentiformis* by its reniform, cordate bracteoles, generally 5 mm long and 10 mm wide, that are born on a slender stipe in open panicles (Wilson 1984 *loc. cit.*). *Atriplex stipitata* is likely more widespread in urban environments and coastal native plant communities than our records indicate. It is one of a number of non-native unidentified *Atriplex* species now widely established in the South Coast region that could be easily mistaken for *A. lentiformis*. These undetermined *Atriplex* species are often vegetatively similar to *A. lentiformis*, but differ by the long-stipitate, often denticulate bracteoles that are cordate, reniform, or orbicular in shape.

Since *A. stipitata* and several other unidentified taxa may be difficult to identify in the field, seed may be inadvertently collected and included in native seed mixes applied during native scrub restoration projects, thereby spreading exotics to new sites in southern California's native plant communities. Accordingly, *A. stipitata* is expected to occur elsewhere on coastal bluffs, scrub, and lagoon habitats in the South Coast region. Botanists, restoration ecologists, seed collectors, and the resource agencies should be vigilant regarding the often locally abundant and widespread distribution of many of the non-native *Atriplex* in southern California.

ATRIPLEX UNDULATA L. (CHENOPODIACEAE).—San Diego Co., City of Del Mar, San Dieguito Wetlands, Racetrack View Dr. ca. 0.25 mi W of Racetrack View Ct., UTM (NAD 83) 11S 04764484E 3647165N, elev. 20 m, locally common on alkaline sandy flats and in open coastal sage scrub around the lagoon, 1 Mar 2003, *Riefner 03-65* (CDA, RSA); same locality, 19 Apr 2003, *Riefner 03-218* (CANB, CDA, RSA); City of Del Mar, San Dieguito Wetlands, San Dieguito Dr. ca. 0.25 mi from Jimmy Durante Rd., UTM (NAD 83) 11S 0475704E 3647724N, elev. 3 m, locally common on roadside and upland transition zone along salt marsh, 6 Aug 2006, *Riefner 06-367* (CDA, RSA).

Previous knowledge. *Atriplex undulata* (wavy-leaved saltbush) is native to Argentina (Patagonia and Buenos Aires) (Cabrera 1963/1970, Flora de la Provincia de Buenos Aires, Col. Cient. INTA, Buenos Aires, Argentina; Carretero 2001, Multequina 10: 67–74). It is widely planted for forage and is adventive in Western Australia (Hussey and Lloyd 2002, Western Weeds, Additions, Deletions and Name Changes, Department of Conservation and Land Management, Western Australia; Barrett-Lennard 2003 *loc. cit.*). In North America, *A. undulata* has not been included in treatments of the Chenopodiaceae in major floras that include non-native exotic plants established in California or in local floras covering the South Coast region (Taylor and Wilken 1993 *loc. cit.*; Roberts 1998 *loc. cit.*; Hrusa et al. 2002 *loc. cit.*; Roberts et al. 2004 *loc. cit.*; Welsh 2004 *loc. cit.*; Rebman and Simpson 2006 *loc. cit.*; Clarke et al. 2007 *loc. cit.*; DiTomaso and Healy 2003, 2007 *loc. cit.*; Grewell et al. 2007 *loc. cit.*; Riefner and Boyd 2007 *loc. cit.*).

Atriplex undulata, a halophyte, is another species of a suite of saltbushes frequently utilized for rehabilitation of saltland pasture and harvested for commercial seed

production in Western Australia (Barrett-Lennard 2003, *loc. cit.*; Menzel and Lieth 2003 *loc. cit.*; Tranen Revegetation Systems 2005 *loc. cit.*). Its seed is also available on the world market, specified for use in rehabilitating saline soils (B & T World Seeds 2008 *loc. cit.*). *Atriplex undulata*, much like *A. amnicol*a and *A. stipitata*, may have been imported for coastal lagoon enhancement projects before the consequences of introducing exotic species into salt marsh and transitional upland habitats were fully understood (Callaway and Zedler 2004, Urban Ecosystems 7: 107–124; Rodgers and Montalvo 2004 *loc. cit.*).

Significance. First documented reports of *A. undulata* for North America. Its unique wavy-margined leaves and small bracteoles make for easy identification. Owing to its availability on the commercial seed market, and use in rehabilitating degraded saline lands, it is likely that *A. undulata* will continue to be applied in erosion control and habitat enhancement projects in southern California. *Atriplex undulata* is expected to occur elsewhere in coastal scrub, salt marsh transition zones, and other lagoon habitats in southern California.

The potential to utilize saline water for irrigation while incorporating halophytes for developing sustainable agricultural production, animal fodder, and rehabilitation of degraded lands are promising, attainable goals for the Mediterranean Region and subtropical dry regions where freshwater resources are limited and conventional agricultural products are unsuited for strongly saline soils (Koyro 2003, *in* Leith and Mochtchenko, eds., Cash Crop Halophytes: Recent Studies, Kluwer Academic Publishers, Dordrecht). *Atriplex*, which is comprised of nearly 150 species identified as halophytes, will likely become an important component of the crops utilized during these efforts (Osmond et al. 1980, Physiological Processes in Plant Ecology: Towards a Synthesis with *Atriplex*, Springer-Verlag, Berlin; Asad 2002 *loc. cit.*; Debez et al. 2003, *in* Leith and Mochtchenko, eds., Cash Crop Halophytes: Recent Studies, Kluwer Academic Publishers, Dordrecht; Menzel and Lieth 2003 *loc. cit.*). The dilemma now presented is how to balance the growing demand to cultivate non-native crops that provide economically beneficial uses in one region while restricting imports to minimize the risk of introducing potentially noxious weeds or invasive pests into native ecosystems elsewhere (Barney and DiTomaso 2008, BioScience 58: 64–70). Therefore, we should expect to find other non-native *Atriplex* species established in southern California's alkaline coastal ecosystems.

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California

Eleusine coracana (L.) Gaertn. subsp. *africana* (Kenn.-O'Byrne) Hilu & De Wet (Poaceae).—Los Angeles Co., Signal Hill, W of 405 Fwy., Temple Ave. at 29th St., UTM (NAD 83) 11S 0392713E 3741666N, elev. 24 m, rare, in pavement cracks and moist soil in roadside gutter, 23 Nov 2003, *Riefner 03-472* (RSA); same locality and date, *Riefner 03-474* (RSA); City of Pasadena, Arroyo Seco Creek, vicinity of Lower Arroyo Park, UTM (NAD 83) 11S 0392515E 3778822N, elev. 119 m, uncommon but widely scattered along creek in wet sand and in *Salix-Baccharis* riparian scrub, 22 Aug 2004, *Riefner 04-380* (RSA); City of South El Monte, San Gabriel River at Thienes Ave., UTM (NAD 83) 11S 0405107E 3766943N, elev. 74 m, uncommon, wet sand on river bank with *Hydrocotyle*, *Ludwigia*, and *Scirpus*, and on disturbed clay soils along bike trail, 28 Aug 2004, *Riefner 04-404* (RSA); near Griffith Park, E bank of Los Angeles River near River Ride Stables, ca. 0.5 mi S of Colorado St., UTM (NAD 83) 11S 0382604E 3777331N, elev. 120 m, widely scattered, moist sandy soil in open riparian scrub, 2 Oct 2006, *Riefner 06-464* (RSA); San Dimas, Puddingstone Reservoir, Bonelli Region County Park at East Shore Dr., UTM (NAD 83) 11S 0426247E 3771609N, elev. 290 m, uncommon on receding lake shoreline, 3 Aug 2007, *Riefner 07-341* (RSA); City of Malibu, along Malibu Rd. ca. 0.5 mi W of Pacific Coast Hwy., UTM (NAD 83) 11S 0340836E 3767080N, elev. 10 m, local, wet roadside depression, 10 Nov 2007, *Riefner 07-498* (RSA). Orange Co., City of San Clemente, San Clemente State Beach, SW corner of park at campground number 156, UTM (NAD 83) 11S 0444133E 3696183N, elev. 37 m, uncommon, disturbed ground in runoff from campground showers, 14 Oct 2003, *Riefner 03-457* (RSA); City of Anaheim, Santa Ana River bottom, E of 57 Fwy. between Orangewood St. and Chapman Ave., UTM (NAD 83) 11S 0418311E 3739098N, elev. 41 m, locally abundant, disturbed wetlands, margin of active channels, and on sandbars in riparian scrub, 8 Aug 2004, *Riefner 04-372* (RSA); City of Irvine, San Diego Creek at Woodbridge High School, S of intersection of Barranca Rd. and West Yale Loop Rd., UTM (NAD 83) 11S 0425279E 3727007N, elev. 27 m, common, native plant-dominated wetlands and sandy wash habitats, 27 Aug 2004, *Riefner 04-386* (RSA); City of Irvine, San Diego Creek at 405 Fwy., UTM (NAD 83) 11S 0429935E 3724259N, elev. 50 m, uncommon, sandy wash and sandbars in riparian scrub, 27 Aug 2004, *Riefner 04-391* (RSA); City of Fountain Valley, along Newland Ave. at Edinger St., UTM (NAD 83) 11S E 409083E 3732691N, elev. 14 m, rare, weed in moist soil along sidewalk, 28 Aug 2004, *Riefner 04-407* (RSA); City of Los Alamitos, Oak Middle School, vicinity of Oak St. at Catalina St., UTM (NAD 83) 11S 0400172E 3741242N, elev. 14 m, common, moist depressions in ball field turf grass, 3 Sep 2004, *Riefner 04-423* (RSA); City of Los Alamitos, W of Oak Middle School along San Gabriel River, UTM (NAD 83) 11S 0400172E 3741242N, elev. 10 m, rare, bank of drainage ditch with *Leptochloa*, 3 Sep 2004, *Riefner 04-424* (RSA); City of Huntington Beach, Golden West College, along Golden West St. near Blue Bonnet Ave., UTM (NAD 83) 11S 0406757E 3733198N, elev. 14 m, locally common, moist soil in roadside gutter, 12 Sep 2004, *Riefner 04-426* (RSA); City of Irvine, Irvine Valley College, along Jeffrey Rd. near Irvine Center Dr., UTM (NAD 83) 11S 0427758E 3726570N, elev. 49 m, uncommon, wet ditch along parking lot and adjacent strawberry field, 12 Dec 2004, *Riefner 04-552* (RSA); City of San Clemente, along El

Camino Real ca. 0.15 mi S of intersection with Los Molinos Rd., UTM (NAD 83) 11S 0441920E 3699403N, elev. 35m, common, moist soil on irrigated slope with ornamental shrubs, 20 Sep 2005, *Riefner 05-671* (RSA); City of Yorba Linda, near Horseshoe Bend along the Santa Ana River, UTM (NAD 83) 11S 0431309E 3749053N, elev. 102 m, widespread but uncommon, banks of urban runoff ditch and wet sand along active channel of Santa Ana River, 5 Oct 2005, *Riefner 05-718* (RSA); City of Irvine, San Diego Creek between Alton Pwky. and 405 Fwy., UTM (NAD 83) 11S 0429336E 3724184N, elev. 51 m, uncommon and scattered on moist sandy banks and wet sand along creek channel, 8 Oct 2006, *Riefner 06-474* (RSA); City of Los Alamitos, Arroyo Park, Heather St. at Lamson Ave., UTM (NAD 83) 11S 0402697E 3738566N, elev. 10 m, common and widespread, wet ditches and moist depressions in turf grass, 17 Oct 2005, *Riefner 05-724* (RSA); City of Huntington Beach, along Slater Ave. near Goldenwest St., UTM (NAD 83) 11S 0406860E 3730121N, elev. 11 m, uncommon, moist soil in *Eucalyptus* woodland and edge of drainage ditch, 4 Oct 2006, *Riefner 06-477* (RSA); City of Irvine, Shady Canyon Rd. at Quail Hill, UTM (NAD 83) 11S 0427699E 3724253N, locally common in drainage ditch and irrigated landscapes, elev. 35 m, 15 Nov 2006, *Riefner 06-677* (RSA). Riverside Co., near Jurupa, intersection of Hellman Ave. at Pine Ave., UTM 11S 0443544E 3757824N (NAD 83), elev. 195 m, locally abundant in roadside drainage ditch, 20 Dec 2003, *Riefner 03-548* (RSA); City of Norco, Sixth St. at Sierra Ave., UTM (NAD 83) 11S 0448759E 3755512N, elev. 200 m, locally abundant, weed in moist clay soil along urban equestrian trial, 30 Jul 2004, *Riefner 04-282* (RSA). San Bernardino Co., City of Fontana, Merrill St. at Olive St., UTM (NAD 83) 11S 0459593E 3772444N, elev. 381 m, uncommon in drainage ditch with *Cyperus* in vacant dirt lot, 5 Oct 2005, *Riefner 05-721* (RSA). San Diego Co., City of Carlsbad, near Laguna Riviera City Park, Kelly Dr. at Park Dr., UTM (NAD 83) 11S 0471025E 3667607N, elev. ca. 13 m, uncommon, drainage ditch and open riparian scrub, 14 Oct 2006, *Riefner 06-542* (RSA); City of San Diego, San Diego River Trail, Robb Field at San Diego River, UTM (NAD 83) 11S 0477053E 3624151N, elev. 3 m, locally abundant in moist sandy soil, 13 Sep 2007, *Riefner 07-385* (RSA). Ventura Co., City of Santa Paula, near intersection of Hallock Dr. and Lemonwood Dr., UTM (NAD 83) 11S 0312334E 3803599N, elev. 85 m, rare, growing with *Cyperus*, *Leptochloa*, and *Baccharis* in urban runoff ditch draining into the Santa Clara River wash, 27 Jun 2004, *Riefner 04-215* (RSA); same location, 24 Sep 2004, *Riefner 04-439* (RSA); City of Fillmore, Santa Clara River bottom, ca. 0.5 mi W of SR-123, UTM (NAD 83) 11S 0323579E 3807088N, elev. 133 m, scattered in wet sand along low-flow river channel, 5 Jul 2007, *Riefner 07-295* (RSA).

Previous knowledge. *Eleusine* species are predominately African, but *E. coracana* (L.) Gaertn. subsp. *africana* (Kenn.-O'Byrne) Hilu & De Wet and *E. indica* (L.) Gaertn. are widely distributed weeds that are easily misidentified (Phillips 1972, Kew Bull. 27: 251–270; Hilu 2003, *in* Flora of North America Editorial Committee, eds., Flora of North America, Vol. 25, Magnoliophyta: Commelinidae (in part): Poaceae, Part 2, Oxford University Press, New York, NY). *Eleusine indica* (goosegrass or wiregrass) is a highly successful cosmopolitan annual that is often a troublesome weed in many warm temperate and tropical countries (Holm et al. 1977, The World's Worst Weeds: Distribution and Biology, University Press of Hawaii, Honolulu, HI). It grows in disturbed areas and lawns throughout the California Floristic Province and most of the contiguous United States (Smith 1993, *in* Hickman, ed., The Jepson Manual: Higher Plants of California, University of California Press, Berkeley, CA; Hilu 2003 *loc. cit.*). *Eleusine coracana* subsp. *africana* (African finger millet, wild finger millet), an annual, is native to East Africa, but is also known from India where it was likely introduced with imported seeds of the cultivated finger millet (*E. coracana* [L.] Gaertn. subsp. *coracana*). In the Western Hemisphere, *E. coracana* subsp. *africana* has been accidentally introduced to Coahuila (*Columbus 2842*; RSA) and Sonora (*Columbus 2721*, *3627*; RSA), Mexico, and to Calhoun County, South Carolina, in the eastern United States (Neves et al. 2005, Molecular Phylogenetics and Evol. 35: 395–419).

Eleusine coracana subsp. *africana* is also weedy in its native East Africa, where it frequently occupies disturbed ground of roadsides, villages, and cultivated lands (Phillips 1972 *loc. cit.*; Van Wyk and Van Oudtshoorn 1999, Guide to Grasses of Southern Africa, Briza Publications, Arcadia, South Africa). It is thought to be the wild progenitor of the cultivated *E. coracana* subsp. *coracana* (finger millet or ragi) that was domesticated in East Africa over 5,000 yr ago and is now grown as a cereal crop in many parts of Africa, Asia, the Arabian Peninsula, China, India, and elsewhere (Phillips 1972 *loc. cit.*; De Wet et al. 1984, Am. J. Botany 71: 550–557; Brisht and Mukai 2002, Plant Syst. Evol. 233: 243–258; Hilu 2003 *loc. cit.*; Neves et al. 2005 *loc. cit.*). In North America, *E. coracana* subsp. *coracana* is often cultivated at agricultural experiment stations and occasionally escapes (Hilu 2003 *loc. cit.*). In the United States, it has been successfully grown as far north as Davis, California, but with difficulty owing to problems of photoperiod sensitivity (National Research Council 1996, Lost Crops of Africa, Vol. I, Grains, Board on Science and Technology for International Development, National Academy Press, Washington, DC). Smith (1993 *loc. cit.*) and Hilu (2003 *loc. cit.*), however, did not provide specific localities for adventive populations.

In general, there has been little disagreement regarding the taxonomy of most *Eleusine* species and distinctive morphological features easily distinguish most taxa. However, the taxonomic status of *E. coracana* s.str., *E. africana* Kenn.-O'Byrne s.str., and *E. indica* has often been disputed (Phillips 1972 *loc. cit.*; Neves et al. 2005 *loc. cit.*). *Eleusine coracana* subsp. *coracana*, a robust annual, is readily distinguished from other taxa in the genus by its large, almost globose seeds and upright habit, which explains the preference of some authors to treat it as a distinct species (Hilu 2003 *loc. cit.*, Neves et al. 2005 *loc. cit.*). However, the large grain size and upright habit are likely the result of agricultural selection produced during domestication. The few genes that control these agriculturally desirable traits and the remaining genome are indistinguishable from its wild progenitor and genetically similar *E. coracana* subsp. *africana* (Neves et al. 2005 *loc. cit.*; Dida et al. 2006, Genetic Diversity in Finger Millet [*E. coracana*] and Related Wild Species, poster presented at the Plant & Animal Genomes XIV Conference, January 14–18, 2006, Town & Country Convention Center, San Diego, CA). Therefore, the rank of subspecies more adequately

reflects the ancestral relationship and genetic similarities of the *E. coracana* taxa (Hilu and De Wet 1976, Econ. Bot. 30: 199–208; Neves et al. 2005 *loc. cit.*).

Morphologically, *E. coracana* subsp. *africana* is most similar to *E. indica* and the two have often been confused, making clear-cut identifications problematic (Phillips 1972 *loc. cit.*; Brisht and Mukai 2002 *loc. cit.*; Neves et al. 2005 *loc. cit.*). However, ongoing taxonomic study and recent molecular analysis have provided important insights regarding the separation of the two taxa. The grains of *Eleusine* species are ornamented and have a unique surface pattern and shape that are useful for identifying and separating *E. coracana* subsp. *africana* from *E. indica*; i.e., oblong seeds with the grain surface shallowly ridged and uniformly granular in *E. coracana* subsp. *africana* and elliptic to ovoid seeds with the grain surface obliquely striate in *E. indica* (Phillips 1972 *loc. cit.*; Hilu 2003 *loc. cit.*). *Eleusine coracana* subsp. *africana* is also a considerably more robust plant and has lower glumes that are 2- or 3-veined, whereas *E. indica* is much more slender and has lower glumes that are 1-veined (Phillips 1972 *loc. cit.*; Hilu 2003 *loc. cit.*). Dida et al. (2006 *loc. cit.*), however, note that the length of the upper glume and broader leaf width of *E. coracana* subsp. *africana* are also reliable morphological characters that can be used to separate it from *E. indica*. In addition to morphological distinctions, molecular analysis has established that *E. indica*, a diploid, is genetically isolated from the tetraploid *E. coracana* subsp. *africana*, and attempts to produce artificial hybrids between them have resulted in sterile plants (Chennaveeraiah and Hiremath 1974, Euphytica 23: 489–495; Hiremath and Salimath 1992, Theor. Appl. Genet. 84: 747–754). Accordingly, molecular analysis has discounted hybridization as an explanation for the difficulties in separating the two taxa (Neves et al. 2005 *loc. cit.*).

Significance. First records of *E. coracana* subsp. *africana* reported for California. *Eleusine coracana* subsp. *africana* has not been included in recent treatments of the Poaceae dealing with exotic plants recently established in California or in local floras covering Orange, Los Angeles, Riverside, San Diego or Ventura counties (Smith 1993 *loc. cit.*; Roberts 1998, A Checklist of the Vascular Plants of Orange County, California, 2nd ed., F.M. Roberts Publications, Encinitas, CA; Hrusa et al. 2002, Madroño 46: 61–98; Hilu 2003 *loc. cit.*; Roberts et al. 2004, The Vascular Plants of Western Riverside County, California: An Annotated Checklist, F. M. Roberts Publications, San Luis Rey, CA; Rebman and Simpson 2006, Checklist of the Vascular Plants of San Diego County, 4th ed., San Diego Natural History Museum, San Diego, CA; Clarke et al. 2007, Flora of the Santa Ana River and Environs, Heyday Books, Berkeley, CA; DiTomaso and Healy 2007, Weeds of California and Other Western States, U.C. Agriculture and Natural Resources Publication 3488, Oakland, CA; Riefner and Boyd 2007, J. Bot. Res. Inst. Texas 1: 709–730).

In southern California, *E. coracana* subsp. *africana* is most common in disturbed, moist-soil urban habitats, including irrigated residential and commercial ornamental landscapes, nuisance runoff and sediment debris flows in street gutters, in culvert outflow basins and drainage ditches, along roadsides and sidewalks, and in turf grass. However, unlike *E. indica*, which is largely restricted to urban environments, *E. coracana* subsp. *africana* has become established in native wetland and riparian habitats and is dispersing rapidly via the numerous urbanized drainage systems located at the wildland-urban interface (WUI) in coastal southern California. New water sources generated by over irrigation of lawns and landscaping, discharge of municipal water treatment plant effluent into natural drainages, increased dry-season stream flows associated with decreased precipitation infiltration and increased hard-surface runoff following storm events, and changes in historic hydrologic regimes have facilitated the establishment of exotic plants and have significantly modified WUI riparian and wetland communities in coastal southern California (Burkhart 2006, Fremontia 34: 14–19; White and Greer 2006, Landscape and Urban Planning 74: 125–138; Riefner and Boyd 2007 *loc. cit.*).

Historically, summer drought and the seasonal nature of stream course flows in the South Coast region have acted as a barrier to colonization by many moisture-dependent exotic plants in the WUI (Brigham 2007, *in* Knapp, ed., Flora and Ecology of the Santa Monica Mountains, Southern California Botanists Special Publication No. 4, Fullerton, CA). Accordingly, increased moisture availability in an otherwise summer-dry Mediterranean climate has thereby promoted the establishment and spread of *E. coracana* subsp. *africana* and several other warm-season moisture-dependant exotic grasses in southern California, including *Dinebra retroflexa* (Vahl.) Panz var. *retroflexa*, *Ehrharta erecta* Lam., *Panicum coloratum* L., and *Setaria adhaerans* (Forssk.) Chiov. (Riefner et al. Madroño 50: 312–313; Clarke et al. 2007 *loc. cit.*; Riefner and Boyd 2007 *loc. cit.*). Although *E. coracana* subsp. *africana* is relatively widespread and can often be locally abundant, these new records suggest that detailed taxonomic and floristic studies are needed to identify and thoroughly document the establishment and dispersal of exotic plants in southern California (Riefner and Boyd 2007 *loc. cit.*). Additional occurrences of *E. coracana* subsp. *africana* should be sought in urban settings and native plant communities associated with summer-wet habitats of sandy stream benches, in open riparian scrub, and the edge of perennial wetlands at the WUI throughout southern and central California.

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California

Senecio linearifolius A. Richard var. *linearifolius* (ASTERACEAE).—Orange Co., City of Irvine, University of California campus, just north of Bonita Canyon Dr. (i.e., directly west of T-intersection of Shady Canyon Cr. and Bonita Canyon Dr. [=Culver Dr.]), low-lying seasonal wetland along a mapped intermittent "blueline" stream, USGS Tustin topographic map, ca. 33°38′N, 117°49′W, ca. 70 m elev.; abundant in a solitary patch about 5–10 m across: *Scott D. White 6783*, 26 Jun 1998 (BRIT, RSA, UCR). At

least four other collections from the same or nearly the same location: *Scott D. White 9613*, 7 Jul 2003 (RSA); *R. Noll s.n.*, 20 Aug 2003 (UCR); *Mark A. Elvin 3011*, 24 Aug 2003 (UCR, CAS [not yet accessioned]); *R. Noll s.n.*, 15 Sep 2003 (RSA, UCR).

Orange Co., City of Laguna Niguel, roadside and steep slope along Pacific Island Drive, USGS Dana Point topographic map, Township 8S, Range 8W, Section 9; ca. 33°29.8′N, 117°43.3′W, ca. 60–120 m elev. Locally common in roadside seeps, both sides of the road. *Scott D. White and Michael Honer 10401*, 17 May 2004 (RSA) and *Scott D. White 10606*, 7 July 2004 (CDA, RSA, UCR).

San Diego Co., Chula Vista, canyon east of Highway 805 on East H Street, between Terra Nova Rd. and Rancho del Rey Parkway; ca. 32°39′39″N, 117°2′13″W; riparian, rocky, sandy loam soil, with *Baccharis salicifolia*, *Salix lasiolepis*, *S. gooddingii* and scrub, with *Artemisia californica*, *Encelia californica*; *Brant Primrose 31*, 16 Oct 2002 (BRIT, SD). Same location, *Brant Primrose 32*, 15 Jan 2003 (SD) and *Jon P. Rebman and Brant Primrose 8298*, 20 Jan 2003 (SD, UMO).

San Diego Co., Mission Valley, ca. 32°48′21″N, 117°6′2″W; near sea level; riparian drainage, with *Salix laseolepis*, *S. goodingii*, *Baccharis salicifolia*, *B. sarothroides*, *Lonicera subspicata*, *Quercus agrifolia*, *Populus fremontii*, *Foeniculum vulgare*, *Picris echioides*, and *Phoenix canariensis*; *Brant Primrose 33*, 12 Aug 2004 (SD).

Identifying these specimens was a years-long international project. Duplicates of the first California specimens (*White 6783* and *Primrose 31*, above) were sent to Theodore Barkley at BRIT (Fort Worth, Texas) for determination. Barkley did not recognize them and was confident they were new for North America. He suggested that they may represent an undescribed taxon, though he evidently had no opportunity to compare them with *Senecios* of other continents before becoming ill. Primrose began work on a description of the material and some specimens (above) may be labeled "*S. serenae* ined." After Barkley's death in 2004 Guy Nesom (also of BRIT) compared the specimens with Australian material at MO and identified them as *S. linearifolius*. That was the first correct determination, but it came too late for full inclusion in the Flora of North America *Senecio* treatment. Instead, the Editorial Committee added *S. linearifolius* as a note in the introduction (T. Barkley 2006, vol. 20 pp. 544–570, Flora of North America, Oxford Univ. Press). Leroy Gross (RSA) made the same determination soon after. There are several varieties of *S. linearifolius* including *S. linearifolius* var. *dangarensis*, an endangered narrow-endemic of basaltic soils on Mt. Dangar in New South Wales (I. Thompson 2004, Muelleria 20:67–110). The determination of *S. linearifolius* var. *linearifolius* was made by Randy Bayer at CANB (Canberra, Australia) in May 2006 from *Rebman and Primrose 8298* (above, annotated specimen at UMO).

Previous knowledge. Senecio linearifolius is native to southeastern mainland Australia and Tasmania "within a few hundred km of coastlines in medium to high rainfall areas of woodlands and forests" (Thompson *op cit.*). Thompson noted further that "it can be a dominant component of understory vegetation especially on disturbed sites such as road verges" and that it ranges from "sea level to alpine altitudes." The variety, *S. linearifolius* var. *linearifolius* is widespread throughout much of the species' range. Its common name is "groundsel fireweed."

Senecio linearifolius var. *linearifolius* is a shrub, ca. 0.6–1.8 m tall, with linear to oblanceolate leaves. There are about 10–50 heads in compact corymbose arrays. The involucres are about 3 mm wide. The ray corollas are about 2–3 mm long; the ray and disc flowers are yellow. The young stems are weakly woody, straight, wand-like, and vertical. It spreads laterally as older stems lay onto the ground and sprout new vertical shoots. The lateral stems may grow to at least 2–3 cm diam., and may not be evident beneath the foliage and closely spaced erect stems or if buried by sediments. Superficially, *S. linearifolius* var. *linearifolius* may resemble the native *Euthamia occidentalis*. Photographs of pressed specimens in Thompson (2004, *op cit.*) may be useful for identification.

Significance. First records for North America. Similar plants were seen by Fred Roberts (pers. comm.) in 1985 along Oso Creek in San Juan Capistrano, near the Laguna Niguel site (above), but were never identified. This observation suggests that *Senecio linearifolius* var. *linearifolius* may have been established in that area without being documented for nearly 20 yr. There also is an unvouchered report from the Sweetwater River in San Diego County (M. Dodero, pers. comm.). In southern California, *S. linearifolius* var. *linearifolius* grows in wetland margins at roadsides, seeps, alkaline flats, and stream channels. Its affinity for disturbed sites, mesic habitats, and its wide elevational range in Australia (Thompson *op cit.*) suggest that it could become invasive throughout cismontane southern California in riparian or seasonal wetlands, as *Arundo donax* and *Tamarix ramosissima* have. Its occurrence in mesic Australian forests and woodlands (Thompson *op cit.*) implies that it could also invade disturbed upland sites in coastal central California and northward. It already is naturalized in New Zealand (Thompson *op cit.*) The California occurrences probably escaped from local cultivation. *Senecio linearifolius* is grown as an ornamental in mainland Australia and Tasmania (davesgarden.com, site accessed 22 Oct 2007) and seed is available by mail order from a French dealer (b-and-t-world-seeds.com, site accessed 21 Oct 2007). It probably is being grown locally in specialty nurseries or traded among garden hobbyists.

We are grateful for Ted Barkley's interest and efforts with this plant. Many thanks to curators, staff and associates of BRIT, CANB, CAS, CDA, RSA, UMO, and UCR, including Randy Bayer, Steve Boyd, Judy Gibson, Leroy Gross, Fred Hrusa, Robin Kennedy, Guy Nesom, Jon Rebman, Andy Sanders, Debra Trock, and Leszek Vincent for their efforts in identifying and piecing together the identifications, history, and whereabouts of the specimens cited here.

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